DOCUMENT-IDENTIFIER: NN9207373

TITLE: Magneto Optic Sensor for Vortices in a Superconductor.

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these

- Disclosed is a device for detecting a vortex or a bundle of vortices used as a storage bit in a superconducting vortex memory. A vortex storage system in which mobile vortices, the information bits, are moved in a shift register by currents and are read out by passing them under a Josephson junction which serves as a detector is proposed in (*). In this system, the presence or absence of a vortex or a vortex bundle represents binary "1" and "0." With the advent of the high Tc superconductors, the vortex storage system has become more practical both because it can be operated at liquid nitrogen temperature and because some of these compounds have very mobile This is evidenced by the observation that some high quality films and single crystals have low critical currents at 77~K. This is particularly true of some of the Bi and Tl copper oxide superconductor compositions in thin-film form. Also, because the vortex mobility (1/viscosity) increases as the normal state resistivity decreases, the oxide superconductors are particularity well suited since they tend to have few carriers and, therefore, a high resistivity in the normal state. The mobility is inversely proportional to the upper critical field which means that these devices will work best close to Tc where the critical field is low. - One of the difficulties of using

superconductors is that reliable Josephson detectors have not been Disclosed is a device for the successfully fabricated. magneto-optic detection of a vortex bundle eliminating the need for a Josephson junction detector. The detector, shown in Fig. 1, consists of a thin film of a magneto-optic transducer 1 deposited on a reflector layer 2 which is, in turn, deposited on the superconductor 3. A suitable magneto-optic transducer is a 2500 A thick film of EuS deposited by electron beam evaporation from an EuS source. A film of this thickness has a Faraday rotation of 20 degrees at a wavelength of 6328 A in an applied field of 31 kF at a temperature of 20~K. The reflector is a thin layer of silver deposited on a film of YBa2Cu3O7 which has been prepared by laser ablation in a separate evaporator. Other parts of the detector consist of a coil 4 for applying a magnetic field locally to the detector, a source of polarized light 5, a means 6 of detecting the polarization state of the light reflected from the surface and a magnetic field source (not shown) to apply a bias field near the lower critical field Hcl. The optical system used in a magneto-optical recording head is suitable for this detector. In operation, the shift register is stepped by one to move a vortex bundle, if present, into the detector region. A current pulse is sent through the coil and, at the same time, the detector region is illuminated with polarized light. If there are no vortices present the superconductor will shield the MO transducer from the field and there will be no change in the rotation of the plane of polarization and the detector will register a "0." If a vortex bundle

vortices resulting in a local field opposite to that of

the magnetic flux will be carried through the

is present, cores of the

the shielding field, causing a change in the rotation of the plane of This will polarization. register as a "1." The signal will be proportional to the relative area of vortex cores to the total area illuminated. The above the core is determined by both the penetration depth and coherence length, and is about two times as large as Hcl at the center of the flux vortex. The area associated with the core is proportional to the square of the coherence length (25x10-8cm). The core is in the normal (nonsuperconducting state) over this area so that the signal will simply depend on the The ratio fractional area. of core area to total area goes approximately like H/Hc2 where H is the applied field and Hc2 is the upper critical field. For a fixed bias field the core area will increase with temperature. By using an injection laser as a light source it should be possible to warm the superconductor to a temperature closer to Tc during readout so as to make the MO signal larger. Also, the thickness of the EuS can be adjusted to 1/4 of the wavelength to enhance the MO signal by multiple reflections. - The rotation of EuS on a silver reflector deposited on a thin film of 123 superconductor is shown in Fig. 2. The temperature dependence is shown for a sample immersed in a uniform external field and illuminated with 6328 A laser light. Shielding currents at the periphery of the film set up a field at the surface of the sample equal and opposite to the applied field. At the superconducting Tc of the sample (about 75~K in this case) flux penetrates the film and the EuS magneto-optic transducer registers a positive field. The other curve in the figure is the normal temperature dependence of the EuS. Other materials with large

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magneto-optic rotation would be suitable as a transducer in this application.

- Reference (*) W. Baechtold, "The Vortex File: A New Application of Type-II Superconductivity," IBM Research Report RZ 842, Zurich, Switzer land (June 1977).

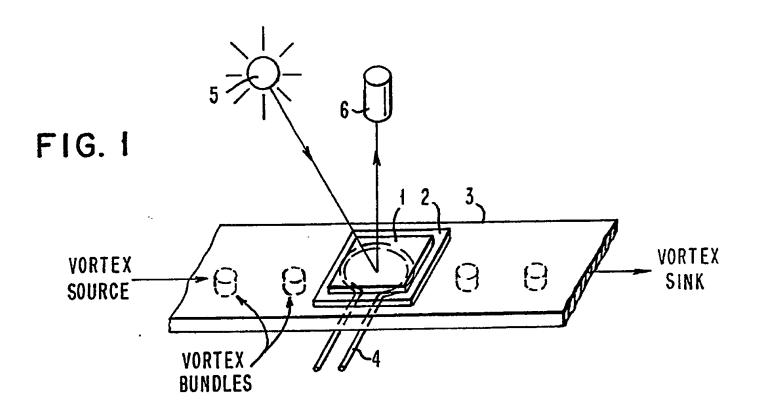
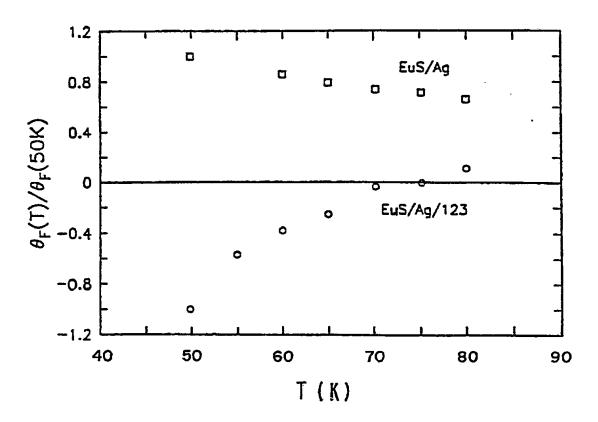


FIG. 2



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-	71	((vortex or vortices) and (pin or pinning or	USPAT;	2003/01/22
		pinned) and flux and (memory or storage or	US-PGPUB;	11:51
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-	20	((vortex or vortices) and (pin or pinning or	USPAT;	2003/01/22
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		storing or stored or ram) and ((magnetic or	EPO; JPO;	
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-	476	((vortices or vortex) same (store or storing	USPAT;	
		or storage or memory or ram)).ti,ab,clm.	US-PGPUB; EPO; JPO;	12:07
	1		DERWENT;	!
			IBM_TDB	
_	5	((vortices or vortex) same (pin or pinning or	USPAT;	2003/01/22
		pinned) same (store or storing or storage or	US-PGPUB;	12:18
		memory or ram)).ti,ab,clm.	EPO; JPO;	
			DERWENT;	
			IBM_TDB	
_	5	6269018.URPN.	USPAT	2003/01/22
_		420010101011111	30.71	12:08
	44	/"EE/4969" "E6/03/3" "E60E96/"	USPAT	2003/01/22
-	11	("5541868" "5640343" "5695864"	JUFAI	12:10
		"5734605" "5764567" "5793697"		12:10
		"5801984" "5841692" "6072718"		
		"6114719" "6130835").PN.		0000/04/00
-	24989	(vortex or vortices).ti,ab,clm.	USPAT;	2003/01/22
			US-PGPUB;	12:18
			EPO; JPO;	
			DERWENT;	
			IBM_TDB	
•	277	((vortex or vortices).ti,ab,clm.) and (pin or	USPAT;	2003/01/22
		pinning or pinned).ti,ab,clm.	US-PGPUB;	12:19
			EPO; JPO;	
			DERWENT;	
			IBM_TDB	
-	17	(((vortex or vortices).ti,ab,clm.) and (pin or	USPAT;	2003/01/22
		pinning or pinned).ti,ab,clm.) and (store or	US-PGPUB;	12:20
		storing or stored or storage or memory or	EPO; JPO;	
		ram).ti,ab,clm.	DERWENT;	
			IBM_TDB	
_	1184	((superconducting or superconductor) near5	USPAT;	2003/01/22
		(memory or storage or store or storing or	US-PGPUB;	12:21
		stored or memory or ram)).ti,ab,clm.	EPO; JPO;	
		otolog of momery of family, diamonin	DERWENT;	
			IBM_TDB	
_	737	(((superconducting or superconductor)	USPAT;	2003/01/22
-	"3"	near5 (memory or storage or store or storing	US-PGPUB;	12:21
		or stored or memory or ram)).ti,ab,clm.) and	EPO; JPO;	
		•	DERWENT;	
		((superconducting or superconductor) near5	1	
		(memory or storage or store or storing or	IBM_TDB	
		stored or memory or ram)).ab.	1	<u> </u>

	65	((((superconducting or superconductor)	USPAT;	2003/01/22
-		near5 (memory or storage or store or storing	US-PGPUB;	12:22
		or stored or memory or ram)).ti,ab,clm.) and	EPO; JPO;	
		((superconducting or superconductor) near5	DERWENT;	
			IBM_TDB	
		(memory or storage or store or storing or	10111_100	
		stored or memory or ram)).ab.) and		
		((superconducting or superconductor) near5		
		(memory or storage or store or storing or		
		stored or memory or ram)).clm.		
_	6	(((((superconducting or superconductor)	USPAT;	2003/01/22
		near5 (memory or storage or store or storing	US-PGPUB;	12:22
		or stored or memory or ram)).ti,ab,clm.) and	EPO; JPO;	
		((superconducting or superconductor) near5	DERWENT;	
ı		(memory or storage or store or storing or	IBM_TDB	
		stored or memory or ram)).ab.) and	_	
		((superconducting or superconductor) near5		
	i	((superconducting or superconductor) hears (memory or storage or store or storing or		
		stored or memory or ram)).clm.) and (vortex		
		or vortices)	HODAT-	2003/01/22
-	2	(((((superconducting or superconductor)	USPAT;	
		near5 (memory or storage or store or storing	US-PGPUB;	12:23
		or stored or memory or ram)).ti,ab,clm.) and	EPO; JPO;	
l I		((superconducting or superconductor) near5	DERWENT;	
ļ 1		(memory or storage or store or storing or	IBM_TDB	
		stored or memory or ram)).ab.) and		
		((superconducting or superconductor) near5		
		(memory or storage or store or storing or		
		stored or memory or ram)).clm.) and (vortex		
		or vortices).ti,ab,clm.		
		6078517.URPN.	USPAT	2003/01/22
-	0	00/001/.UKPN.	JUI A.	12:22
ļ	_	(#4400000# #400000F# #400404F#	USPAT	2003/01/22
-	6	("4130893" "4280095" "4601015"	USPAI	12:22
		"5191236" "5227645" "5388068").PN.	HEDAT	
-	4	4764898.URPN.	USPAT	2003/01/22
				12:23
-	19	(((((superconducting or superconductor)	USPAT;	2003/01/22
		near5 (memory or storage or store or storing	US-PGPUB;	12:23
		or stored or memory or ram)).ti,ab,clm.) and	EPO; JPO;	
		((superconducting or superconductor) near5	DERWENT;	
		(memory or storage or store or storing or	IBM_TDB	
		stored or memory or ram)).ab.) and		
		((superconducting or superconductor) near5		
		(memory or storage or store or storing or		
		stored or memory or ram)).clm.) and		
		(flux).ti,ab,clm.	L	

•	4	((((((superconducting or superconductor)	USPAT;	2003/01/22
	1	near5 (memory or storage or store or storing	US-PGPUB;	12:23
		or stored or memory or ram)).ti,ab,clm.) and	EPO; JP ;	
		((superconducting or superconductor) near5	DERWENT;	
		(memory or storage or store or storing or	IBM_TDB	
		stored or memory or ram)).ab.) and	_	
		((superconducting or superconductor) near5		
		(memory or storage or store or storing or		
		, · · · · · · · · · · · · · · · · · · ·		
		stored or memory or ram)).clm.) and (vortex		
		or vortices)) and (flux).ti,ab,clm.		0000/04/00
-	6	5289150.URPN.	USPAT	2003/01/22
	=			12:24
-	5	("4000036" "4176291" "4348630"	USPAT	2003/01/22
		"5011823" "5110793").PN.		12:24
•	9	5388068.URPN.	USPAT	2003/01/22
				12:24
_	50	("3387286" "3744038" "3914702"	USPAT	2003/01/22
		"3953749" "4130893" "4360898"		12:25
		"4398267" "4414480" "4430582"		,
	l i	"4437227" "4458495" "4499119"		
		1		1
		"4509146" "4518868" "4609836"		
		"4633439" "4638185" "4638187"		
		"4663620" "4706240" "4710649"		
		"4719369" "4727266" "4760292"		
		"4779230" "4780750" "4785426"		
		"4791321" "4807183" "4817082"		
		"4837536" "4845539" "4845722"		
		"4849751" "4852083" "4859897"		
		"4888629" "4891682" "4920512"		
		"4974205" "4980580" "4994434"		
		"5024993" "5030617" "5051627"		
		"5057491" "5071832" "5107461"		
		"5166562" "5253199").PN.		
	50	("3387286" "3744038" "3914702"	USPAT	2003/01/22
-	50	1 ,	OSFAI	12:25
	İ	"3953749" "4130893" "4360898"		12:23
		"4398267" "4414480" "4430582"		
		"4437227" "4458495" "4499119"		
		"4509146" "4518868" "4609836"		
		"4633439" "4638185" "4638187"		
		"4663620" "4706240" "4710649"		
i i		"4719369" "4727266" "4760292"		
		"4779230" "4780750" "4785426"		
ĺ		"4791321" "4807183" "4817082"		
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1	1	"5166562" "5253199").PN.		

	250	/!!C FO70240 \$!!C 4496444 \$	USPAT;	2003/01/22
•	259	(US-5079219-\$ or US-4186441-\$ or US-3999204-\$ or US-3775673-\$ or	US-PGPUB;	12:41
			EP ; JPO;	12.71
		US-3676718-\$ or US-6023161-\$ or	DERWENT;	
		US-5683967-\$ or US-5338943-\$ or	·	
		US-6269018-\$ or US-6266289-\$ or	IBM_TDB	
		US-5827170-\$ or US-4869598-\$ or		
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		US-5093313-\$ or US-5070702-\$ or		
		US-4939976-\$ or US-4802951-\$ or US-4728591-\$ or US-4190817-\$ or		
		US-6317303-\$ or US-6242939-\$ or		
		US-6193194-\$ or US-6078517-\$ or		
		US-5953224-\$ or US-5942765-\$ or		
		US-5903152-\$ or US-5872731-\$ or		
		US-5726873-\$ or US-5656870-\$ or		
		US-5644218-\$ or US-5629889-\$).did. or		
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- 10	(((US-5079219-\$ or US-4186441-\$ or	USPAT;	2003/01/22
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	US-3676718-\$ or US-6023161-\$ or	EPO; JPO;	
	US-5683967-\$ or US-5338943-\$ or	DERWENT:	
	US-6269018-\$ or US-6266289-\$ or	IBM TDB	
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	US-4409579-\$ or US-6452764-\$ or		
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	US-5260264-\$ or US-5247475-\$ or		
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	27	((US-5079219-\$ or US-4186441-\$ or	USPAT;	2003/01/22
		US-3999204-\$ or US-3775673-\$ or	US-PGPUB;	12:45
		US-3676718-\$ or US-6023161-\$ or	EPO; JPO;	
		US-5683967-\$ or US-5338943-\$ or	DERWENT;	
		US-6269018-\$ or US-6266289-\$ or	IBM_TDB	
		US-5827170-\$ or US-4869598-\$ or		
		US-4409579-\$ or US-6452764-\$ or		
		US-6368878-\$ or US-6221812-\$ or		
	!	US-6188920-\$ or US-6104633-\$ or		
		US-5946228-\$ or US-5912210-\$ or		
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	85	(vortex or vortices).clm. and (pin or pinning	USPAT;	2003/01/22
•	00	or pinned).clm.	US-PGPUB;	12:47
		- C. p	EPO; JPO;	
			DERWENT;	
			IBM_TDB	
_	3	((vortex or vortices).clm. and (pin or pinning	USPAT;	2003/01/22
_		or pinned).clm.) and (superconducting or	US-PGPUB;	12:48
		superconductor)	EPO; JPO;	
		Superiorii di di di di di di di di di di di di d	DERWENT;	
			IBM_TDB	
_	277	(vortex or vortices).ti,ab,clm. and (pin or	USPAT;	2003/01/22
-		pinning or pinned).ti,ab,clm.	US-PGPUB;	12:48
		pinning or pinnea/iti/ac/joinn	EPO; JPO;	
			DERWENT;	
			IBM_TDB	
	18	((vortex or vortices).ti,ab,clm. and (pin or	USPAT;	2003/01/22
-	: 1 0	pinning or pinned).ti,ab,clm.) and	US-PGPUB;	12:49
		(superconducting or superconductor)	EPO; JPO;	121-70
		(Superconducting of Superconductor)	DERWENT;	
			IBM_TDB	
	17	((vortex or vortices).ti,ab,clm. and (pin or	USPAT:	2003/01/22
-	17	1	US-PGPUB;	12:49
		pinning or pinned).ti,ab,clm.) and	EPO; JPO;	12.43
		(superconducting or	DERWENT;	
		superconductor).ti,ab,clm.	IBM_TDB	
	۱ ۵۰	((USPAT;	2003/01/22
-	12	((vortex or vortices).ti,ab,clm. and (pin or	,	12:50
		pinning or pinned).ti,ab,clm.) and (store or	US-PGPUB;	12:50
		storing or stored or memory or	EPO; JPO; DERWENT;	
		ram).ti,ab,clm.	IBM_TDB	
	3	((())	USPAT;	2003/01/22
•	3	(((vortex or vortices).ti,ab,clm. and (pin or	US-PGPUB;	13:25
		pinning or pinned).ti,ab,clm.) and	EPO; JPO;	10120
		(superconducting or	DERWENT;	
		superconductor).ti,ab,clm.) and (store or	IBM_TDB	
		storing or stored or memory or	10111_100	
	707	ram).ti,ab,clm.	USPAT;	2003/01/22
•	737	((superconducting or superconductor) near5	US-PGPUB;	13:26
		(store or storing or stored or storage or	EPO; JPO;	13.20
		memory or ram)).ab.	DERWENT;	
			1	
		///	IBM_TDB USPAT;	2003/01/22
	65	(((superconducting or superconductor)	1	13:27
		near5 (store or storing or stored or storage	US-PGPUB;	13:21
		or memory or ram)).ab.) and	EPO; JPO;	
		((superconducting or superconductor) near5	DERWENT;	
		(store or storing or stored or storage or	IBM_TDB	
		memory or ram)).clm.		0000/04/00
-	11	(((superconducting or superconductor)	USPAT;	2003/01/22
		near5 (store or storing or stored or storage	US-PGPUB;	13:30
l	1	or memory or ram)).ab.) and (pin or pinning	EPO; JPO;	!
1	1	or pinned) and flux	DERWENT;	
			IBM_TDB	

•	9	((((superconducting or superconductor)	USPAT;	2003/01/22
		near5 (store or storing or stored or storage	US-PGPUB;	13:31
		or memory or ram)).ab.) and (pin or pinning	EPO; JPO;	
		or pinned) and flux) and (magnetic near	DERWENT;	
		field)	IBM_TDB	
_	3	(((((superconducting or superconductor)	USPAT;	2003/01/22
		near5 (store or storing or stored or storage	US-PGPUB;	13:32
		or memory or ram)).ab.) and (pin or pinning	EPO; JPO;	
		or pinned) and flux) and (magnetic near	DERWENT;	
		field)) and (vertex or vortices or vortex or	IBM_TDB	
	1	vortical or vortexes)		
-	4	4764898.URPN.	USPAT	2003/01/22
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-	33658	(vortex or vertex or vortexes or vortices or	USPAT;	2003/01/22
		vortical).ab.	US-PGPUB;	13:33
		, , , , , , , , , , , , , , , , , , ,	EPO; JPO;	
			DERWENT;	
			IBM_TDB	
_	4476	((vortex or vertex or vortexes or vortices or	USPAT;	2003/01/22
-	4476	vortical).ab.) and (vortex or vertex or	US-PGPUB;	13:34
		vortexes or vortices or vortical).clm.	EPO; JPO;	· =
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-	150	(((vortex or vertex or vortexes or vortices or	US-PGPUB;	13:35
		vortical).ab.) and (vortex or vertex or	1	13.33
		vortexes or vortices or vortical).clm.) and	EPO; JPO;	
	1	(magnetic or magnetically or	DERWENT;	
		magnetical).clm.	IBM_TDB	2003/01/22
-	19	((((vortex or vertex or vortexes or vortices	USPAT;	13:35
		or vortical).ab.) and (vortex or vertex or	US-PGPUB;	13:33
		vortexes or vortices or vortical).clm.) and	EPO; JPO;	
		(magnetic or magnetically or	DERWENT;	
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		stored or storage or memory or ram).clm.		0000/04/00
-	13	((((()))))	USPAT;	2003/01/22
		or vortical).ab.) and (vortex or vertex or	US-PGPUB;	13:36
		vortexes or vortices or vortical).clm.) and	EPO; JPO;	
		(magnetic or magnetically or	DERWENT;	
		magnetical).clm.) and (store or storing or	IBM_TDB	
		stored or storage or memory or ram).clm.)		
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		memory or ram).ab.		
-	3	((((((vortex or vertex or vortexes or vortices	USPAT;	2003/01/22
		or vortical).ab.) and (vortex or vertex or	US-PGPUB;	13:37
		vortexes or vortices or vortical).clm.) and	EPO; JPO;	1
		(magnetic or magnetically or	DERWENT;	
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		and (store or storing or stored or storage or		
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•	273	(US-5079219-\$ or US-4186441-\$ or	USPAT;	2003/01/22
		US-3999204-\$ or US-3775673-\$ or	US-P PUB;	13:39
		US-3676718-\$ or US-6023161-\$ or	EPO; JPO;	
		US-5683967-\$ or US-5338943-\$ or	DERWENT;	
		US-6269018-\$ or US-6266289-\$ or	IBM_TDB	
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	137	((US-5079219-\$ or US-4186441-\$ or	USPAT;	2003/01/22
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		US-3676718-\$ or US-6023161-\$ or	EPO; JPO;	4
		US-5683967-\$ or US-5338943-\$ or	DERWENT;	
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•	3	((((US-5079219-\$ or US-4186441-\$ or	USPAT;	2003/01/22
	ĺ	US-3999204-\$ or US-3775673-\$ or	US-PGPUB;	13:42
		US-3676718-\$ or US-6023161-\$ or	EPO; JPO;	
		US-5683967-\$ or US-5338943-\$ or	DERWENT;	
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	7	(/-i	HCDAT.	2003/01/22
•	8	((pin or pinning or pinned) same (magnetic	USPAT;	13:47
	ļ	or magnetically or magnetical) same (vortex	US-PGPUB;	13:47
		or vortices or vortexes or vertex) same	EPO; JPO;	
		(detect or detecting or detected or	DERWENT;	' !
,]	detector))	IBM_TDB	
-	5	(((pin or pinning or pinned) same (magnetic	USPAT;	2003/01/22
]	or magnetically or magnetical) same (vortex	US-PGPUB;	13:45
		or vortices or vortexes or vertex) same	EPO; JPO;	l
		(detect or detecting or detected or	DERWENT;	
		detector))) and flux	IBM_TDB	
-	3	((pin or pinning or pinned) and (magnetic or	USPAT;	2003/01/22
		magnetically or magnetical) and (vortex or	US-PGPUB;	13:48
, 		vortices or vortexes or vertex) and (detect	EPO; JPO;	
		or detecting or detected or detector) and	DERWENT;	
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		dipolar))	_	
	24	((pin or pinning or pinned) and (magnetic or	USPAT;	2003/01/22
]	_	magnetically or magnetical) and (vortex or	US-PGPUB;	13:50
		vortices or vortexes or vertex) and (detect	EPO; JPO;	
1		or detecting or detected or detector) and	DERWENT;	
		(dipole or dipolar))	IBM_TDB	
	20	((pin or pinning or pinned) and (magnetic or	USPAT:	2003/01/22
		magnetically or magnetical) and (vortex or	US-PGPUB;	13:51
		vortices or vortexes or vertex) and (detect	EPO; JPO;	
{		or detecting or detected or detector) and	DERWENT;]
		(dipole or dipolar) and (store or storing or	IBM TDB	ļ
		stored or storage or memory))	15155	
ļ _	8	((pin or pinning or pinned) and (magnetic or	USPAT;	2003/01/22
_		magnetically or magnetical) and (vortex or	US-PGPUB;	13:53
ļ	ļ	vortices or vortexes or vertex) and (detect	EPO; JPO;	.0.00
		or detecting or detected or detector) and	DERWENT;	
		(dipole or dipolar) and (store or storing or	IBM_TDB	ĺ
		stored or storage or memory) and	15111_155	
	_	(superconducting or superconductor))	HEDAT:	2003/04/22
-	7	((pin or pinning or pinned) and (magnetic or	USPAT;	2003/01/22
1	}	magnetically or magnetical) and (vortex or	US-PGPUB;	13:54
		vortices or vortexes or vertex) and (detect	EPO; JPO;	
		or detecting or detected or detector) and	DERWENT;	!
}		(dipole or dipolar) and (store or storing or	IBM_TDB	
1		stored or storage or memory) and		
		(superconducting or superconductor) and		
		(tip or probe))		0000104/00
-	0	(((pin or pinning or pinned) and (magnetic or	USPAT;	2003/01/22
		magnetically or magnetical) and (vortex or	US-PGPUB;	13:54
		vortices or vortexes or vertex) and (detect	EPO; JPO;	
1		or detecting or detected or detector) and	DERWENT;	
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1		stored or storage or memory) and		{
		(superconducting or superconductor) and		
		(tip or probe))) and (vortex or vertex or		
	<u> </u>	vortices or vortexes).ti,ab,clm.		<u> </u>

•	339	(pin or pinning or pinned) near3 (vertex or	USPAT; US-PGPUB;	2003/01/22 13:55
		vortex or vortices or vortexes)	· ,	13:55
			EPO; JPO;	
			DERWENT;	
			IBM_TDB	
•	50	((pin or pinning or pinned) near3 (vertex or	USPAT;	2003/01/22
		vortex or vortices or vortexes)).clm.	US-PGPUB;	13:56
			EPO; JPO;	
			DERWENT;	
			IBM_TDB	
-	1	(((pin or pinning or pinned) near3 (vertex or	USPAT;	2003/01/22
		vortex or vortices or vortexes)).clm.) and	US-PGPUB;	13:57
		flux.clm.	EPO; JPO;	1
			DERWENT;	
			IBM_TDB	
	3	(((pin or pinning or pinned) near3 (vertex or	USPAT;	2003/01/22
		vortex or vortices or vortexes)).clm.) and	US-PGPUB;	13:59
		(store or storing or stored or storage).clm.	EPO; JPO;	
			DERWENT;	
;			IBM_TDB	į
-	41	(magnetic near (vortex or vortices)).ab.	USPAT;	2003/01/22
			US-PGPUB;	14:00
			EPO; JPO;	
			DERWENT;	
			IBM_TDB	
_	47	((magnetic near (vortex or vortices)).ab.)	USPAT;	2003/01/22
		(magnetic near (vortex or vortices)).clm.	US-PGPUB;	14:00
		,,	EPO; JPO;	ė.
			DERWENT;	
			IBM_TDB	
1_	4	((magnetic near (vortex or vortices)).ab.)	USPAT;	2003/01/22
-	-	and (magnetic near (vortex or vortices)).clm.	US-PGPUB;	14:01
		and (magnetic near (rettex or rettere)).	EPO; JPO;	
			DERWENT;	
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i_	9	(superconducting same (vortex or	USPAT;	2003/01/22
_		vortices)).ti.	US-PGPUB;	14:02
	!	101 (1063)).U.	EPO; JPO;	
			DERWENT;	
			IBM_TDB	
	0	((((superconducting or superconductor)	USPAT;	2003/01/22
-	1	11111	US-PGPUB;	14:02
		same (vortex or vortices)).ti.) and	EPO; JPO;	17102
		((superconducting or superconductor) same	1	
		(vortex or vortices)).ab.) and	DERWENT;	
		((superconducting or superconductor) same	IBM_TDB	
		(vortex or vortices)).clm.		2002/04/22
-	10		USPAT;	2003/01/22
		(vortex or vortices)).ti.) and	US-PGPUB;	14:02
		((superconducting or superconductor) same	EPO; JPO;	
1		(vortex or vortices)).ab.	DERWENT;	
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•	15	((superconducting or superconductor) same (vortex or vortices)).ti.	USPAT; US-PGPUB;	2003/01/22 14:05
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			DERWENT:	
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-	18	((superconducting or superconductor) same	USPAT;	2003/01/22
		(vortex or vortices)).clm.	US-PGPUB;	14:06
			EPO; JPO;	
			DERWENT;	
			IBM_TDB	
•	15	(((superconducting or superconductor) same	USPAT;	2003/01/22
		(vortex or vortices)).clm.) and (flux)	US-PGPUB;	14:07
			EPO; JPO;	
			DERWENT;	
	_ !		IBM_TDB	Í
•	7	((((superconducting or superconductor)	USPAT;	2003/01/22
		same (vortex or vortices)).clm.) and (flux))	US-PGPUB;	14:07
		and (anchor or anchoring or anchored or	EPO; JPO;	
		trap or trapping or trapped)	DERWENT;	
		(////	IBM_TDB	2003/01/22
-	4	(((((superconducting or superconductor)	USPAT;	14:07
	; 	same (vortex or vortices)).clm.) and (flux))	US-PGPUB;	14:0 <i>1</i>
		and (anchor or anchoring or anchored or trap or trapping or trapped)) and (detect or	EPO; JPO; DERWENT;	
		detecting or detector)	IBM TDB	
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